Computational Management Science 1

Spring 2019 Final

registration number: .....

(Do not write your name on the test - just the 7 digit student id number.)

All examples are evaluated using the Python programming language, version 3.6.

1. (6 points) Writing Code

   (a) (3 points, ≤5 minutes) Functions
   Write a function `sum_if(iterable, predicate)` in Python that takes a sequences of numbers length and a predicate (boolean valued function). It must return the sum of each element if the element fulfills the predicate. e.g.
   `sum_if((1, 3, 4, 7, 8), lambda x: x % 2)` ⇒ `11`
   `sum_if([3, 5, 1, 2, 4], lambda x: x > 3)` ⇒ `9`
   Add a proper docstring to receive full points.

   (b) (3 points, ≤5 minutes) Classes and data structures
   Implement a simple data structure in Python. The data structure must be capable of storing a circle in a two dimensional drawing application (i.e. the coordinates of the center as well as the radius). Write a **minimalistic** class (`__init__(.)`). You don't need to implement any functionality, just a class that stores the required data. Don't forget to write docstrings in order to receive full points.

2. (6 points, ≤10 minutes) Correct Mistakes
   The following code contains 6 syntax errors/ typos. Clearly mark and correct the mistakes. (*hint: you don't need to understand what the function does to correct the mistakes as there are no logical errors; assume that all required classes are available → just look for syntax errors*)

```
Class Point(object):
    "A Point in a two-dimensional Euclidean plane."""

    def __init__(self, x: float, y -> float):
        self.__x = x
        self.__y = z

    def __str__[self]:
        return (f'Point(x={self.x}, y={self.y})')

    @property
    def x(self):
        return self.__x

    @property
    def y(self):
        return self.y
```

3. (9 points, ≤10 minutes) 3rd Party Libraries

   (a) (2 points)
   What is the purpose of `argparse`?

   (b) (3 points)
   What is a Series? What is a DataFrame? Which 3rd party package provides them?

   (c) Name (in total) two advantages and / or disadvantages of PuLP over other modeling languages (2p).

   (d) Finally, name one thing you like about this course and one thing that should be improved in the future (be honest!) (2p).

4. (12 points, ≤10 minutes) Reading and Understanding Code
What is the output of the following code snippets? Write exactly what the output of each snippet is if the snippet is the sole content of a Python file. If the output is an error message, it is enough to write "ERROR". If there is no output, write "-"

(a) Simple calculation

```
num = 3
num++
```

(b) Loop

```
prices = (4, 5, 2)
total = 0.0
for price in prices:
    total += price
print("Total:", total)
```

(c) Function

```
def add(a, b):
    return a + b
perimeter_right_triangle(5, 3)
```

(d) List

```
l = (5, 3, 2)
l.append(1)
print(sum(l))
```

(e) Numpy

```
import numpy as np
m = np.zeros(4).reshape(2,2)
print(m[0,1])
```

(f) Lists

```
l = [2, 4, 3]
print(l.append(1))
```

5. (9 points, ≤10 minutes) Various

   (a) (3 points)
   What is a generator expression (PEP 289)? Which key advantage does it have? Provide at least one example.

   (b) (3 points)
   What is inheritance? What is composition? Which relationship types does each of them model?

   (c) (3 points)
   What is git? What can be done with it? What are its limitations and downsides?

6. (6 points, ≤5 minutes) Writing Files
   In one of your Python programs, a series of key-value pairs are the central results. Your employer asks you to design and implement a function that stores permanently these results. Explain how you approach the problem and why you decide to do so. Implement the function `save(filename: str, pairs: dict) -> None` that takes a filename string and the key value pairs. The function should write the key-value pairs to a file with the given name. Any representation of the data is ok as long as it allows to easily read the data back in from the file (but you don't need to implement the reading function, just the writing function). Don't forget to document the function in order to receive full points.